

REMARKS/ARGUMENTS

Claims 9-37 are active. Claims 9, 10, 34 and 35 have been amended to replace the term "chitosan-type carrier" with the term "chitosan bead". Support for this amendment is found in the specification at page 10, lines 16-17. Claim 13 has been amended to refer to a secondary fermentation. Support for this amendment is found on page 24, line 15, of the specification. Accordingly, the Applicants do not believe that any new matter has been added.

The Applicants thank Examiner Sherrer for the courteous and helpful discussion of March 5, 2004. The method of Sapporo, which involves gel-coated immobilized yeasts and suppression of diacetyl formation, was reviewed. It was noted that page 4, lines 12-19, of the specification discloses a secondary or after-fermentation in which diacetyls are removed. The Examiner indicated that he would likely maintain the obviousness rejection, unless the Applicants further distinguished the claimed process from that of Sapporo. Accordingly, the Applicants have now amended the claims to further distinguish the gel-coated yeasts of Sapporo from the immobilized yeasts of the present invention. Additionally, Claim 13 has been amended to refer to a secondary fermentation. Favorable consideration is respectfully requested.

Election/Restriction

The Restriction Requirement has been made FINAL. Currently, the elected species is:

Carrier: chitosan  
Final product: malt alcoholic beverage  
Bioreactor: fluidized bed

The Applicants understand that upon an indication of allowability for a generic claim

that additional species will be examined.

Rejection—35 U.S.C. 103

Claims 9, 10, 13-17, 21, 23, 25-28 and 33-37 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sapporo Breweries, JP 6197749, in view of Szlavko, J. Amer. Soc. Brewing Chem. 2:59-60.

The Applicants submit that this rejection is now moot as the cited prior art does not disclose or suggest a process using chitosan beads. Sapporo is directed to using immobilized yeast to continuously produce beer. The yeasts are immobilized with a gel, e.g., chitosan gel (page 2, paragraph [0011]). Sapporo does not disclose or suggest a method involving chitosan beads as now required by the claims. A bead and gel have completely different physical properties. Moreover, the functions of the chitosan gel of Sapporo and the chitosan bead of the present invention are different.

The present invention uses a chitosan bead as a carrier for non-flocculent yeast, which enables the use of a non-flocculent yeast in a bioreactor fermentation. Use of a non-flocculent yeast results in a more constant fermentation rate and in the maintenance of stable levels of floating yeast cells upon the end of fermentation (specification, page 3, line 17-page 4, line 2). Moreover, the number of floating yeast cells upon the end of fermentation can stably be maintained at a level further preferable for the secondary fermentation. The present invention reduces the amount of diacetyl in the fermentation liquid and final product sufficiently for primary fermentation of malt alcoholic beverages with improved flavor; see the specification, page 4, lines 4-19. On the other hand, chitosan gel disclosed by Sapporo is used merely as an aggregate.

Tables 4 and 5 in the present specification substantiate the improvements obtained by selection of a non-flocculent yeast compared to a flocculent strain.

Table 4 on page 22 (reproduced below) shows that a method using non-flocculent strains NA-3 and NA-4 produced significantly higher numbers of floating yeast cells upon the end of primary fermentation, compared to a method using flocculent strain A-2. Increasing the number of floating yeast cells upon the completion of primary fermentation provides a more stable and controllable process, see page 2, and lines 19-21, of the specification.

Table 4

	NUMBER OF FLOATING YEAST CELLS UPON THE END OF PRIMARY FERMENTATION ( $10^6$ cells/ml)				
NUMBER OF FERMENTATION TIMES	1	2	3	4	AVERAGE
NA-3	24	23	39	28	28.5
NA-4	29	33	30	18	27.5
A-2	5	12	25	31	18.3

Table 5 on page 23 of the specification, reproduced below, shows that a method using the two non-flocculent strains, NA-3 and NA-4, reduced the amount of diacetyl significantly compared to a method using flocculent strain A-2. A high concentration of diacetyl causes a raw odor or immature odor which is organoleptically undesirable, see page 2, lines 13-16.

Table 5

	AMOUNT OF DA UPON THE END OF PRIMARY FERMENTATION (ppm)							
NUMBER OF FERMENTATION TIMES	1	2	3	4	5	6	7	AVERAGE <sup>*2</sup>
NA-3	0.42	0.36	0.36	0.33	0.60	0.38	0.41	0.41
NA-4	0.55	0.49	0.39	0.42	0.37	0.44	0.42	0.44
A-2	0.53	0.42	0.98	0.49	1.27	0.90	0.78	0.77

\*2: normal level: about 0.4 ppm

Sapporo does not disclose or suggest selection of a non-flocculent yeast, nor provide a reasonable expectation of success for reducing diacetyl levels by making such a selection. Szlavko et al. was cited as teaching the benefits of nonflocculent strains for producing higher tryptophol (a flavor component) levels than flocculent strains. However, there is no suggestion in Szlavko to immobilize a non-flocculent yeast in a bioreactor, nor any reasonable expectation that a non-flocculent strain would, in fact, provide any benefit under the fermentation conditions inside a bioreactor, e.g. there is no suggestion that higher tryptophol levels would be produced under these conditions, nor any suggestion for the results obtained by the present inventors as shown in Tables 4 and 5 above.

Accordingly, the Applicants respectfully request that this rejection be withdrawn in view of (1) the limitation of the claims to nonflocculent yeasts immobilized on beads, (2) the lack of any suggestion in the prior art for selecting a non-flocculent yeast for immobilization in a bioreactor, and (3) the lack of any reasonable expectation of success for obtaining a superior fermentation method by selection of a non-flocculent yeast for use in a bioreactor.

CONCLUSION

In view of the above amendments and remarks, the Applicants respectfully submit that this application is now in condition for allowance. Early notification to that effect is earnestly solicited.

Respectfully submitted,

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